

## Variations in Farmers' Seeds of Two Rice Varieties Produced in Four Districts of Assam

B.M. BUZAR BARUAH, K.K. SHARMA\* AND P.K. BARUA  
Department of Plant Breeding & Genetics,  
Assam Agricultural University, Jorhat 785 013  
pkbarua@aau.ac.in

Rice is the most important crop of Assam and deserves special attention for increasing productivity, which primarily depends on use of quality seeds by the farmers. Being a self-pollinated crop, rice seeds can be maintained for several generations without losing its genetic purity. In practice, however, progressive deterioration of original stock occurs through admixture with other varieties and species in cultivators' fields and in the threshing and processing yards. A small percentage of cross-pollination with other varieties cannot be ruled out. Farmers generally use their own-saved seeds for raising the crops. According to the Assam State Seed Plan [1], replacement rate of rice seeds with certified seeds is only 4.5 per cent in the state. Many farmers, who have been growing the released rice varieties, complain that these varieties are not performing well. However, the farmers do not follow proper methods to maintain the purity of the seeds. Deterioration of seed quality takes place due to minor residual segregation, chance mutation, natural cross pollination, and variety admixtures [2].

Mahsuri is the most popular variety among the producers and consumers of Assam. Of late, Ranjit is gaining popularity due to higher yield, and Mahsuri-type grain quality. Often farmers complain about the deterioration of these varieties. Therefore, a study was made to investigate the farmers' perception about these two varieties, quality of farmers' saved seed, and the extent of deterioration and genuineness of their seeds by taking these two varieties as a case study.

A survey was conducted in 1997 for the farmers' perception of the two popular rice varieties *viz.*, Mahsuri and Ranjit regarding their deterioration in four districts *viz.* Jorhat, Nagaon, Kamrup and BARPETA amongst 115 randomly chosen farmers who had been growing these two varieties for at least five years. Altogether 22 samples of Mahsuri and 21 of Ranjit, harvested in November 1998, were collected from the farmers. Sample size varied from 500 g to 1000 g. For moisture determination, 50-100 g samples were collected in 250 gauge polythene bags. Breeder's seeds of these two varieties were obtained from the Regional Agricultural Research Station, Titabar to use as standards.

The collected seed samples were tested in the laboratory to evaluate germination, physical purity and moisture content. Working samples of the tests were obtained with the help of mechanical divider following ISTA procedures [3]. The genuineness of the varieties was assessed through observation of seed morphological characters in the laboratory and through grow out tests. Seeds of other distinguishable varieties (ODV) were identified through visual seed examination [4].

Data were recorded on 1000 seed weight in grams using an electronic balance, length to breadth ratio, and kernel length to breadth ratio, length and breadth being measured on 10 seeds in millimeter with the help of slide calipers.

Grow out test was conducted in the instructional-cum-research farm, Assam Agricultural University,

\* Regional Agricultural Research Station, Titabar 785630, Assam

Table 1. Quality of farmers' saved seeds compared to breeders seed of rice cv. Mahsuri and Ranjit

Parameter	Minimum certification standards (%)	Number of samples tested		Number of samples conforming to standard		Number of samples not conforming to standard		Range in the samples not conforming to standard	
		Mahsuri	Ranjit	Mahsuri	Ranjit	Mahsuri	Ranjit	Mahsuri	Ranjit
Physical purity	98.0	22	19	12	8	10	11	96.0 - 97.8	91.0 - 97.9
Germination %	80.0	22	19	21	18	1	1	7.7	77.4
Moisture content	13.0 8.0	22	19	0	0	22	19	14.0 - 14.3	13.9 - 14.3
O.D.V.	20/kg	22	19	2	0	20	19	56.6 - 946.6	80.0 - 1373.6
Off-types	2.0	18	16	11	15	7	1	2.36-52.90	68.76

Jorhat in *Kharif* 1999. The observations were made throughout the growing period based on the descriptors of the varieties. Observations were recorded for off type plants (%), days to 50% flowering, plant height (cm), flag leaf area [5], ear bearing tillers per plant, panicle length (cm), number of grains per panicle, spikelet fertility (%), and grain yield (kg/ha).

Analyses of variance were done for all the characters [6]. Square root transformation of the data on ODV and number of off types was made before statistical processing.

#### Farmers' perception on the deterioration of the varieties

The sampled farmers had been growing both the varieties. Mahsuri was the preferred variety from consumers' point of view and it is older than Ranjit. The Mahsuri growers (45%) had been growing this variety for more than 10 years and half of the farmers had been growing it for more than 5 years. However, 63 per cent of the farmers growing Ranjit had been doing so for less than 5 years, and 37 per cent had been growing it for 5 to 10 years. Among the farmers growing Mahsuri, 77 per cent believed that there was general deterioration of performance of the variety while 63 per cent of the farmers growing Ranjit felt that the performance had gone down.

All the farmers believed that there was deterioration in yielding ability of the two varieties. Panicles of the two varieties were reportedly shorter than the original as expressed by 41 of the farmers growing Mahsuri and 58 per cent growers of Ranjit. They perceived that panicles shortened in length, and incidence of pests and diseases, admixtures and number of chaffy grains increased in both the varieties.

Among the respondents, 41 per cent collected seeds of Mahsuri from Assam Seed Corporation, Assam Agricultural University and Department of Agriculture (Govt. of Assam) while 84 per cent growers collected seeds of Ranjit from these sources. Majority of Mahsuri growers (59%) collected the seed from fellow farmers while only 16 per cent Ranjit growers did so. Majority of the farmers (63% for Mahsuri and 75% for Ranjit) were willing to maintain their own seed stocks.

Farmers generally keep aside a portion of the harvest for seed and they do not raise a separate seed crop. Few of them (13% for Mahsuri and 21% for Ranjit) practiced roguing in the standing crops. Most of them (87% Mahsuri, 79% Ranjit) selected seeds after harvest. Perhaps this was one of the reasons why farmers' observation of deterioration of cultivars within 5 years of cultivation. Mahsuri has distinguishable seeds as compared to Ranjit. Variety admixtures can be more easily removed in the field than in seed selection after harvest as the seeds of related varieties look alike. The survey revealed that the farmers perceived that the popular varieties deteriorated in their fields within short time. It also underscored the importance of farmers' education for raising seed crops.

#### Quality of farmers' saved seed

For evaluating quality of the farmers' seed samples the physical purity, moisture content, germination percentage and ODV were compared with the minimum seed certification standards of certified seeds [7] as given in Table 1.

Seed purity percentages varied from 92.7 to 99.1 in Mahsuri, and from 91 to 99.3 in Ranjit. Ten of the 22 farmers' samples of Mahsuri (45%) and 11 of the 19 samples of Ranjit (58%) fell below the certification

Table 2. Performance of crops raised from farmers' saved and breeder seed for yield and related characters

Parameter	Performance of breeder seed		Number of farmers' samples tested		Number of samples conformed to breeder seed level		Number of samples deviating from breeder seed level		Range in the samples not conformed	
	Mahsuri	Ranjit	Mahsuri	Ranjit	Mahsuri	Ranjit	Mahsuri	Ranjit	Mahsuri	Ranjit
Days to 50% flowering	116.7	136.7	18	16	15	15	3	1	100.3-124.3	141.3
Plant height (cm)	126.5	117.0	18	16	15	16	3	0	119.0-119.2	-
Number of tillers/plant	12.4	11.1	18	16	14	13	4	3	15.8-16.9	14.0-15.7
Panicle length (cm)	25.7	26.7	18	16	18	16	0	0	-	-
Number of grains/panicle	215.0	214.2	18	16	17	16	1	0	141.0	-
Spikelet fertility (%)	86.0	87.7	18	16	18	14	0	2	-	75.2-81.0
Grain yield/ha(q)	37.10	52.05	18	16	17	15	1	1	17.06	21.2

standard for purity. All the seed samples were high in seed moisture content (14.1% in Mahsuri and 14.2% in Ranjit) and as a result none of the samples conformed to the minimum certification standard of moisture. This could be due to the high relative humidity in the atmosphere. The seeds were good in germination percentage excepting one each in the two varieties that failed to show the minimum certification standard. One sample of Mahsuri showed exceptionally low germination (7.7%). Majority of the farmers' seeds showed admixture of other varieties to very high degree (Table 1). Only 2 samples of Mahsuri fulfilled the minimum certification standard (20 /kg) for ODV. None of the samples of Ranjit could meet this standard. Therefore, more than 90 per cent samples of Mahsuri, and all samples of Ranjit were found to be genetically impure due to high proportion of ODV.

Thus the seeds used by the farmers were of poor quality with respect to moisture content, physical purity and genetic purity. The study revealed that the poor yield performance is due to poor quality of seeds saved by the farmers on their own. Though sometimes, the difference in yield between certified seed and farmers' saved seed samples are masked by environment, the survey over years representing farmers with different background knowledge indicated that the yield of certified seeds were

15-20 per cent higher than farmers' saved seed samples [2].

In the growout test, eleven farmers' samples of Mahsuri and fifteen of Ranjit conformed to the minimum certification standards (Table 1). In the other samples percentages of off types ranged from 2.36 to 52.9 in Mahsuri. In Ranjit, the single sample that did not conform to the certification standard, the percentage of off type was very high (68.76%). Like for ODV, many of the farmers' samples failed to meet the minimum standard of off-types or genetic purity.

For the quantitative characters, which do not show easily detectable variation for the farmers unless the variations are very prominent, three samples showed statistically distinct variation below the breeder's seed in Mahsuri (Table 2). Similarly, two samples for plant height and one sample each for grains per panicle and seed yield falling below the breeder's seed standard in this variety. In the cv. Ranjit, one sample each for days to flowering, spikelet fertility and grain yield was significantly below the level of breeder's seed.

Nine morphological qualitative characters were observed. However, none of the farmers' samples showed any deviation from the breeder's seeds. Qualitative characters being more conspicuous than quantitative characters, these were better retained

in the farmers' fields. The farmers' samples showed much variation for 1000 seed weight. For this character 41 and 58 per cents of the farmers' samples of Mahsuri and Ranjit respectively, deviated significantly from the breeder's seeds. For seed length: breadth ratio 2 and 3 samples of these two varieties respectively, deviated significantly from the breeder's seeds.

A number of farmers' samples were sub standard for physical purity and ODV. High proportions of inert materials were observed which were mainly due to inadequate post harvest operations like winnowing and storage. High proportions of inert materials are reported in farmers' samples of rice seeds [8, 9, 10]. Lack of roguing in the field and careless post-harvest handling resulted in high proportion of ODV in most of the farmers' samples. The survey revealed that majority of the farmers did not practice roguing in the seed fields. Similar observations were made in rice [8, 11], and in wheat [12, 13].

There were quantitative reductions in grain yields of the crops raised from farmers' samples compared to the crops raised from breeder seeds. However, reduction was drastic and statistically significant in one sample of each of Mahsuri and Ranjit (Table 2). Similarly samples of Mahsuri and one sample of Ranjit significantly deviated from the level of breeder seed for days to flowering. Four samples deviated significantly from breeders seed for plant height, four samples for tillers/plant, and one sample for grains/panicle in Mahsuri. In Ranjit, one sample deviated significantly from breeder seed for days to flowering, three samples for tillers/plant, and two samples for spikelet fertility.

Thus seed quality was reflected in the yield performance of the crop. The farmers need to be educated about the importance and advantages of using good quality seeds and be trained for maintaining the seed quality by adopting pre and post harvest measures so as to harvest good yields of the desired varieties.

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